

REMARKS

Status of the Application

Claims 1-29 were previously pending.

Claims 4-6, 13, 14, 18-20, and 27-29 were objected to as being in improper multiple-dependent form.

Claims 1, 2, 4-6, 9-12, 15-16, 18-20, and 23-26 were rejected under 35 USC 102(e) as being anticipated by Ramaswamy (US 200220163966).

Claims 3 and 17 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966).

Claims 7, 13, 21, 27, and 29 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966) in view of Tourapis (US 7,280,700).

Claims 8, 14, 22, and 28 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966) in view of Tourapis (US 7,280,700), and further in view of Sriram et al. (US 20030063667).

Applicant has amended claims 1-6, 8-20, and 22-29, and canceled claims 7 and 21. No new claim is added. No new matter adds through the amendments. For the reasons discussed below, withdrawal of the rejections is requested.

Claim Objections

Claims 4-6, 13, 14, 18-20, and 27-29 were objected to as being in improper multiple-dependent form.

Claims 4-6, 13, 14, 18-20, and 27-29 have been amended to correct the dependency. Therefore, withdrawal of the objection is requested.

Claim Rejections- 35 U.S.C. 102(e)

Claims 1, 2, 4-6, 9-12, 15-16, 18-20, and 23-26 were rejected under 35 USC 102(e) as being anticipated by Ramaswamy (US 200220163966).

Applicant has amended claims 1 and 15 to incorporate the contents of claims 7 and 21, respectively. Therefore, the rejections to claims 1, 2, 4-6, 9-12, 15-16, 18-20, and 23-26 are now moot.

Claim Rejections- 35 U.S.C. 103(a)

Claims 3 and 17 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966).

Claims 3 and 17 depend on claims 1 and 15, respectively.

Applicant has amended claims 1 and 15 to incorporate the contents of claims 7 and 21, respectively. Therefore, the rejections to claims 3 and 17 are now moot.

Claims 7, 13, 21, 27, and 29 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966) in view of Tourapis (US 7,280,700).

Applicant has amended claim 1 to incorporate the contents of claim 7.

In step 1 of original claim 1, a predicted quantization parameter is used to rate distortion optimization mode selection, in step 2, if final quantization parameter is different from the predicted, a second rate distortion mode selection is executed again, therefore, it can be seen that the rate distortion optimization mode selection in step 1 is a first rate distortion optimization mode selection. In original claim 7, the QP in the formula $D(s,c,MODE|QP) + \lambda_{MODE}R(s,c,MODE|QP)$ is a quantization parameter for the current macroblock, and in step 1, the quantization parameter is the predicted quantization parameter. Therefore, it can be seen that the QP in the formula $D(s,c,MODE|QP) + \lambda_{MODE}R(s,c,MODE|QP)$ is equal to the predicted quantization parameter in the first rate distortion mode selection. Therefore, the amendments to the original claim 1 do not go beyond the disclosure of the original specification.

Claim 1 as amended reads as:

Claim 1. A method for rate distortion optimization (RDO) based rate control comprising:

Step 1: performing bit allocation for every picture in a GOP which includes an I frame, a P frame, or a B frame, and **based on the allocated bits a predicted quantization parameter being used to do a first rate distortion optimization mode selection for every macroblock in the current picture, wherein the predicted quantization parameter is the quantization**

parameter of a previous macroblock, and a coding mode minimizing the following formula is selected as the initial coding mode for the current macroblock:

$$D(s, c, MODE | QP) + \lambda_{MODE} R(s, c, MODE | QP)$$

wherein s is the luma value of the original macroblock, c is the luma value of the reconstructed macroblock, λ_{MODE} is the lagrangian constant;

$$\text{for I/P frame, } \lambda_{MODE} = 0.85 \times 2^{\frac{Q_{max}}{3}};$$

$$\text{for B frame, } \lambda_{MODE} = 4 \times 0.85 \times 2^{\frac{Q_{max}}{3}};$$

$D(s, c, MODE | QP)$ is used to evaluate the distortion of the current macroblock after it is coded with mode $MODE$;

$R(s, c, MODE | QP)$ is the bits used to code the macroblock with mode $MODE$;

QP is a quantization parameter for the current macroblock, and is equal to the predicted quantization parameter in the first rate distortion mode selection;

Step 2: the information collected from the first rate distortion mode selection being used to calculate a final quantization parameter for rate control, and if the final quantization parameter is different from the predicted, a second rate distortion mode selection will be executed again.

The cited references at least fail to teach or suggest the above underlined features of the amended claim 1.

Clearly, Ramaswamy does not teach or suggest the above underlined features of the amended claim 1.

Tourapis (column 11, lines 54-67) discloses that the function incorporates a Lagrangian multiplier corresponding to either I/P frame or B frames. But Tourapis does not disclose a predicted quantization parameter being used to do a first rate distortion, and does not disclose the exact value of the function, especially the value of QP as defined in claim 1.

For at least the reasons discussed above, claim 1 is patentable over Ramaswamy and Tourapis. Claims 2-6, and 9-13 depend from claim 1 and, thus, are also patentable over Ramaswamy and Tourapis for at least the same reasons.

For similar reasons as claim 1, the amended independent claim 15 is patentable over Ramaswamy and Tourapis. Claims 16-20, 23-27, and 29 depend from claim 15 and, thus, are also

patentable over Ramaswamy and Tourapis for at least the same reasons.

Claims 8, 14, 22, and 28 were rejected under 35 USC 103(a) as being unpatentable over Ramaswamy (US 200220163966) in view of Tourapis (US 7,280,700), and further in view of Sriram et al. (US 20030063667).

Sriram was cited to teach the claimed equation for selecting a motion vector as recited in claims 8, 14, 22, and 28. However, Sriram cannot cure the above discussed deficiencies of Ramaswamy and Tourapis. Therefore, independent claims 1 and 15 as well as their dependent claims 8, 14, 22, and 28 are patentable over Ramaswamy, Tourapis, and Sriram.

Conclusion

In view of the foregoing amendments and remarks, it is respectfully submitted that the remaining claims are now in condition for allowance. Allowance of this application is earnestly solicited.

Respectively submitted
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Date: February 25, 2010

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